A historical perspective on primary and possible secondary sources of atmospheric Carbon Tetrachloride

Hanwant B. Singh, NASA Ames Research Center, USA

Atmospheric sources of Carbon Tetrachloride (CTC) have been controversial since its detection in the early 1970. Initial proposals were that it is globally uniformly distributed and its lack of current emissions and inferred lifetime indicated that it was likely of natural origin. Historical analysis of CTC use and emissions showed that atmospheric CTC was long-lived and mainly of man-made origin although small natural sources and sinks (e. g. oceans) could not be ruled out. This deduction was hard because a majority of emissions had occurred in early part of the 20th century when CTC was commonly used as a fumigant, a solvent, and a raw material for the manufacture of many chemicals. In the 1940's adverse health effects of exposure to CTC became evident and its emissions were greatly curtailed and substituted with C2Cl4 which was thought to be much safer. There were smog chamber studies that showed that C2Cl4, a widely used solvent during the late 20th century, could produce CTC with up to a 7% yield. Subsequently it was discovered that this chemistry probably required Cl atoms and since Cl atoms were not abundant in the atmosphere actual yields based on OH oxidation were probably closer to 0.1%. CTC was subsequently banned by the Montreal Protocol to prevent stratospheric ozone depletion and its preferred substitute C2Cl4 was also banned by EPA for reasons of potential carcinogenicity and toxicity. CTC since has been measured in many airborne NASA campaigns in which plumes have been sampled from a variety of regions which may still be emitting CTC. I will briefly discuss this historical perspective of CTC and show some recent data that may shed light on its current sources or lack there off.